

PATENT ABSTRACTS OF JAPAN

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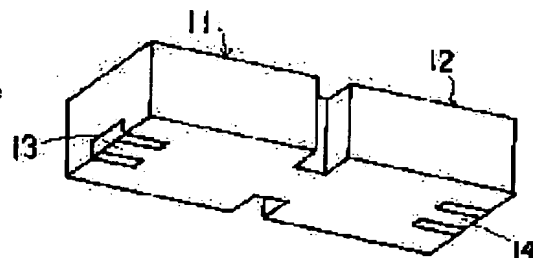
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(54) WAVEGUIDE-TYPE DIELECTRIC FILTER

(57)Abstract:

PROBLEM TO BE SOLVED: To eliminate discontinuity between the signal lines of a wiring board and the input/output electrodes of a waveguide-type dielectric filter so as to reduce the dielectric filter in reflection or radiation loss.

SOLUTION: Conductor patterns 13 and 14 extending inwards from the edges of a base are used as input/output electrodes and connected to microstrip lines or coplanar lines. The conductor films 13 and 14 are extended to the edge of the edge face of a dielectric body, and the dielectric body is exposed at the edge face where the conductor films 13 and 14 are brought into contact. The tongue-shaped conductor films 13 and 14 serve as input/output electrodes and are connected to the microstrip lines or coplanar lines which are of the same width with the conductor films and formed on a wiring board. The dielectric body is partly exposed around the conductor films 13 and 14, and the other surface of the dielectric body containing the connected parts is all covered with a conductor film.



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CLAIMS

[Claim(s)]

[Claim 1] In the waveguide mold dielectric filter which the dielectric resonator of two or more rectangular parallelepipeds was connected, and equipped the resonator of both ends with the I/O electrode The same base of the resonator of both ends is arrived at around there from the location distant from the one side. the conductor which a dielectric exposes to both sides -- the whole surface of the dielectric had the input/output terminal electrode by the membranous tongue-shaped piece, and the dielectric has exposed the part which touches at the tip of the tongue-shaped piece of the side face which touches around there, and excluding the circumference of an I/O electrode, and a joining segment -- a conductor -- the waveguide mold dielectric filter characterized by what the film was formed for.

[Claim 2] The waveguide mold dielectric filter according to claim 1 by which an I/O electrode is connected with the microstrip line of a wiring substrate.

[Claim 3] The waveguide mold dielectric filter according to claim 1 by which an I/O electrode is connected with the KOPURENA track of a wiring substrate.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to a waveguide mold dielectric filter, and relates to the structure of the I/O electrode especially. It is related with the input-output structure which can be used for the resonator which constitutes the filter, the duplexer using the filter, etc.

[0002]

[Description of the Prior Art] as the filter used in a frequency band several GHz or more -- the dielectric of a rectangular parallelepiped -- a conductor -- use of the dielectric filter of the waveguide mold which is made to combine two or more resonators covered by the film, and acquires a desired property inquires -- having -- **** -- the phase of utilization -- welcoming -- like is supposed. Since it has structure which filled up the conventional guided wave ***** with the dielectric, the miniaturization of size is attained.

[0003] However, in this kind of waveguide mold dielectric filter, the joint structure of an input/output terminal poses a big problem. Until now, as shown in drawing 11, what formed the through tube in the dielectric, the thing which formed the conductor pattern of I/O in the side face of a dielectric as shown at drawing 12 are proposed.

[0004] However, in a connection part, discontinuity with the track on the circuit board becomes large, the loss of I/O joint structure [such] by the reflection and radiation by discontinuity increases very much, and it has especially the problem of not being suitable for utilization in a high frequency band 10GHz or more. Although adopting the shielding structure for making radiation and reflection small is also considered, the problem of the increment in the man day accompanying the increment in components mark and cost arises.

[0005]

[Problem(s) to be Solved by the Invention] This invention makes small discontinuity of the input/output terminal electrode of a filter when mounting a waveguide mold dielectric filter in the circuit board, and the signal line on a substrate as much as possible, and offers a means to reduce the loss caused by reflection and radiation of the electromagnetic field in the I/O section. And it realizes with easy electrode structure.

[0006]

[Means for Solving the Problem] This invention solves the above-mentioned technical problem by forming the conductor pattern of the same configuration as the I/O electrode of a waveguide mold dielectric filter the I/O electrode side of the waveguide mold dielectric filter of the signal line on the circuit board.

[0007] Namely, the dielectric resonator of two or more rectangular parallelepipeds is connected, and it sets in the waveguide mold dielectric filter which equipped the resonator of both ends with the I/O electrode. The same base of the resonator of both ends is arrived at around there from the location distant from the one side. the conductor which a dielectric exposes to both sides -- the whole surface of the dielectric had the input/output terminal electrode by the membranous tongue-shaped piece, and the dielectric has exposed the part which touches at the tip of the tongue-shaped piece of the side face which touches around there, and excluding the circumference of an I/O electrode, and a joining segment -- a conductor -- it has the description for the film to have been formed.

[0008]

[Embodiment of the Invention] The electrode pattern of the shape of the same shape of a microstrip line as the signal and line which were formed in the base of the I/O stage of a waveguide mold dielectric filter at the circuit board (print) which mounts that waveguide mold dielectric filter, and a coplane track is formed, and termination of this conductor pattern is carried out on the base concerned. While connecting with the signal line of the circuit board, the signal supplied from the circuit board is combined with the resonance mode inside a waveguide mold dielectric filter by this.

[0009]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. Drawing 1 is the perspective view showing the example of this invention. Specific inductive capacity connects the dielectrics 11 and 12 of two 5.2mmx5.2mmx2.5mm rectangular parallelepipeds by 2.3mm width of face at the dielectric of 9.0 with the same dielectric whose die length is 1.0mm. the conductor whose die length is 1.4mm by the side of an end face to 1.0mm width of face on the same base -- film 13 and 14 was formed and the dielectric is exposed to those both sides by 0.5mm width of face.

[0010] a conductor -- the conductor of the end face which film 13 and 14 is extended to the side of the end face of a dielectric, and touched around there -- the dielectric is exposed also for the part which touches film 13 and 14. these tongue-shaped conductors -- film 13 and 14 serves as an I/O electrode, and is connected with the microstrip line of the same width of face or coplane track formed in the wiring substrate. a conductor -- although the dielectric is exposed in a part of perimeter of film 13 and 14 -- other front faces -- a connection part -- containing -- the whole surface -- a conductor -- it has covered by the film.

[0011] The property of the waveguide mold dielectric filter shown in drawing 1 is shown in drawing 2. The waveguide mold dielectric filter with few 450MHz and the insertion losses to 0.6dB and loss was obtained [center frequency] for 12.97GHz and 3dB bandwidth.

[0012] Although it is necessary to enlarge association with a resonator and an external circuit in order to make bandwidth of a filter large, association with an external circuit can be adjusted by changing the dimension of an I/O electrode pattern. If the gap around an I/O electrode pattern (outcrop of a dielectric) is enlarged, an outer join can be enlarged and bandwidth can be extended.

[0013] Drawing 3 is the perspective view showing other examples of this invention. Although it is the almost same structure as the above, the dielectrics 31 and 32 of two 5.2mmx4.8mmx2.5mm rectangular parallelepipeds are connected by 2.3mm width of face with the same dielectric whose die length is 1.0mm. the conductor whose die length is 1.4mm by the side of an end face to 1.0mm width of face on the same base -- film 33 and 34 was formed and the dielectric is exposed to those both sides by 1.0mm width of face. the above -- the same -- a conductor -- although the dielectric is exposed in a part of perimeter of film 33 and 34 -- other front faces -- a connection part -- containing -- the whole surface -- a conductor -- it has covered by the film.

[0014] The property of the waveguide mold dielectric filter shown in drawing 3 is shown in drawing 4. The waveguide mold dielectric filter with few 980MHz and the insertion losses to 0.5dB and loss was obtained [center frequency] for 13.12GHz and 3dB bandwidth. Thus, bandwidth is more than twice by having extended the gap of an I/O electrode.

[0015] A waveguide mold dielectric filter may connect three or more resonators, in order to acquire a desired band-pass response. Drawing 5 is the perspective view showing other examples of this invention. 55 dielectricity of the dielectrics 51 and 52 of two 5.2mmx5.2mmx2.5mm rectangular parallelepipeds and the 5.2mmx5.0mmx2.5mm rectangular parallelepiped arranged in the meantime is connected by 2.3mm width of face with the same dielectric whose die length is 1.0mm. the conductor whose die length is 1.4mm by the side of an end face to 1.0mm width of face on the same base -- film 53 and 54 was formed and the dielectric is exposed to those both sides by 0.5mm width of face.

[0016] The property of the waveguide mold dielectric filter shown in drawing 5 is shown in drawing 6. The waveguide mold dielectric filter with little loss was similarly obtained for center frequency like [13.01GHz and 3dB bandwidth / 400MHz and an insertion loss] 0.9dB and an above-mentioned example. Since the number of stages was increased, the damping property outside a passband is steep.

[0017] An I/O electrode can choose the location and sense as arbitration, as shown in drawing 7 (a) - (f). However, to form in the same front face (base) is required. Moreover, the part of an I/O electrode can also be made to project, as shown in drawing 8.

[0018] The mounting structure of the waveguide mold dielectric filter by this invention is explained. Drawing 9 embeds the waveguide mold dielectric filter 90 at a printed circuit board 96, and it is in the condition before mounting and (b) is in the condition after mounting, and (a) solders, as shown in (b) and the I/O electrodes 93 and 94 and the KOPURENA track 97 serve as the same flat surface. In this case, there is an advantage to which the continuity of a track is kept high.

[0019] Other mounting structures of the waveguide mold dielectric filter by this invention are explained. Drawing 10 carries the waveguide mold dielectric filter 100 on a printed circuit board 106, it is in the condition before mounting, (b) is in the condition after mounting, and (a) solders an I/O electrode and the KOPURENA track 107. In this case, although the discontinuity of a track arises, an assembly has the advantage which becomes easy. A signal-line way may use a microstrip line.

[0020]

[Effect of the Invention] Since the I/O electrode of a configuration with which the signal-line way on the circuit board was extended is entering and carrying out termination to the dielectric resonator according to this invention, the I/O signal of the TEM mode flows on a base. According to this current, the field by which induction is carried out to the interior of the resonator of a waveguide mold combines with the field of the basic resonance mode of the resonator of a waveguide mold, and association with an external circuit and a resonator arises as that result.

[0021] Consequently, a signal-line way and an I/O electrode are shown in the same front face, and since it is the same width of face, the reflection and radiation of a RF signal which the continuity of the signal line of the circuit board and the input/output terminal electrode of a filter is maintained, and are produced in discontinuity can be controlled, and it becomes possible to decrease loss.

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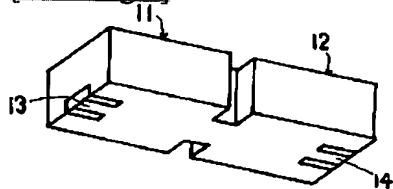
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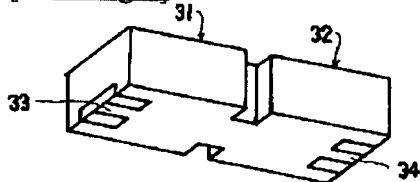
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DRAWINGS

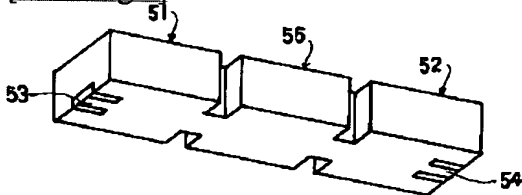
[Drawing 1]



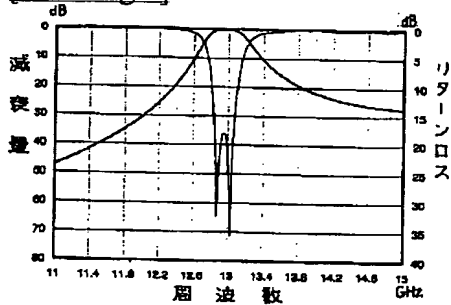
[Drawing 3]



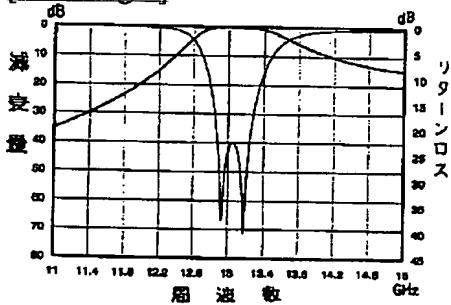
[Drawing 5]



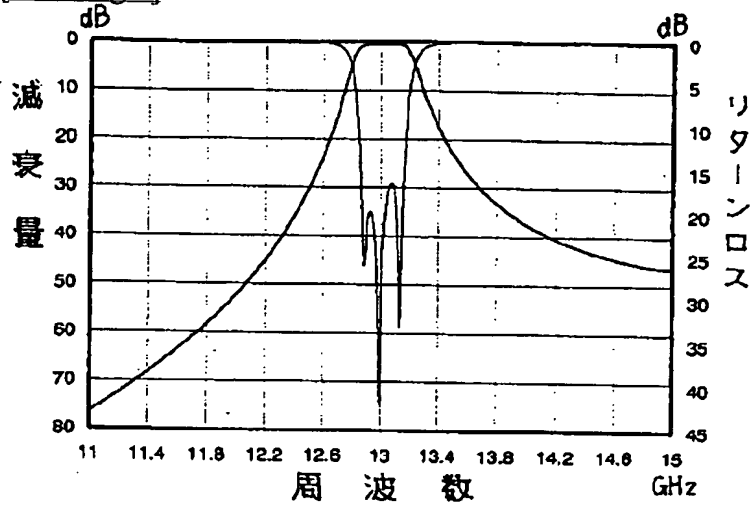
[Drawing 2]



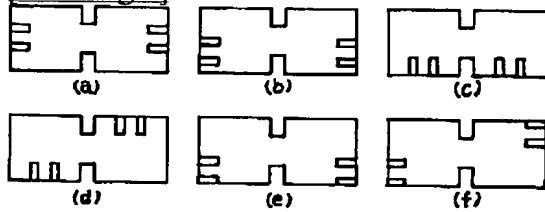
[Drawing 4]



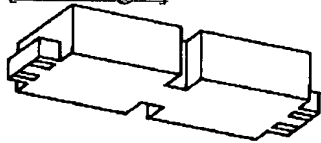
[Drawing 6]



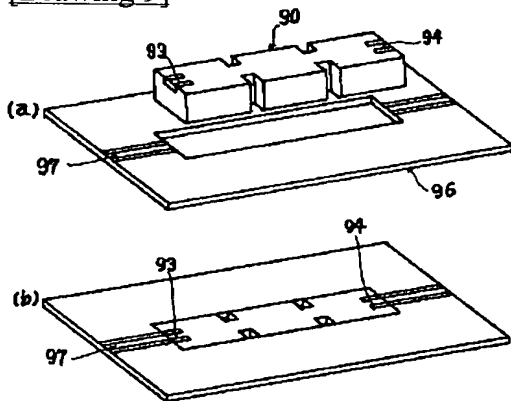
[Drawing 7]



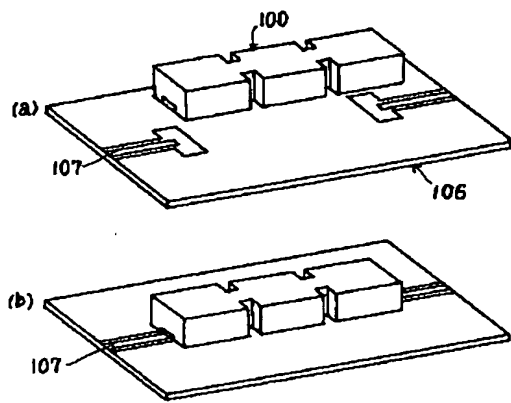
[Drawing 8]



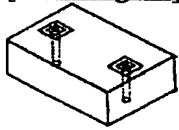
[Drawing 9]



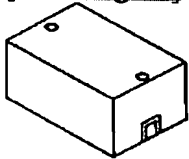
[Drawing 10]



[Drawing 11]



[Drawing 12]



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